Installation manual

FGC LON

FLYGT
a xylem brand

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Read This First

Read this first

Before any installation or configuration, read this chapter carefully. It contains general information on documentation, safety and guarantee.

Product documentation

This manual describes the configuration when the LON communication module is used in a Flygt FGC 313/323. If the LON module is used in an FGC series I or FGC Series II, there are limitations and differences:

- Menu names and functionality may be different. For more information on menus names and functionality in an FGC Series I or II, refer to its User manual.
- All diagnostic programs may not be available.

Safety regulations for owner/operator

- All government regulations, local health and safety directives must be observed.
- All danger due to electricity must be avoided.

Guarantee

- Modifications or changes to the unit/installation should be carried out only after consulting Xylem.
- Original spare parts and accessories authorized by the manufacturer are essential for compliance with the terms of the guarantee. The use of other parts may invalidate any claims for warranty or compensation.

We are not responsible for communication problems that are caused by interference's on the powerline.

If a working system stops working because of new interference's, Xylemis not responsible.

Used symbols

WARNING:

Safety instruction

Risk of personal damage.

Electrical Hazard:

Safety instruction

Risk of personal damage - dangerous voltage.

NOTICE:

Special attention value

Risk of apparatus or component damage.

Safety instruction

Electrical Hazard:

Electrical wiring must be carried out only by a qualified electrician. All electrical installation work must be carried out with the equipment disconnected from the power supply, without any possibility of being made live, and in accordance with local regulations.

An external switch or circuit breaker must be provided adjacent to the building installation to enable the installed equipment to be isolated from the power supply. The external switch or circuit breaker must be acting on all poles.

This external switch or circuit breaker must be:

- Located close to installed equipment,
- Easily accessible to the user, and
- Marked to show that it belongs to the installed equipment.

Observe all precautions for handling electrostatic sensitive devices before opening the unit.

NOTICE:

The FGC has a high degree of protection against moist and dirt, but should always be installed so that it will not be unnecessarily exposed to water or the risk of external physical damage.

An FGC may be used only in the manner specified by the manufacturer.

The manufacturer does not allow any internal modifications to be made in the unit.

Always keep this manual with the installed unit.

Use cables that minimize interference from electrical and magnetic fields. Run the cables in a way that further minimize interference.

The many potential sources of such interference include relay coils, solenoid valves, switches, thyristor units, earth (ground) currents and static discharges.

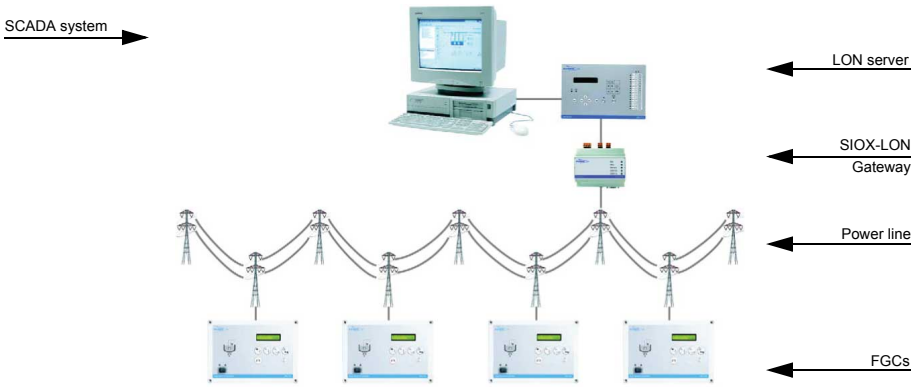
Susceptibility to interference also varies with the electrical environment i.e. to factors such as cable lengths, screening and the use, or otherwise, of interference suppression. Many problems can be prevented by good planning.

Overview of Flygt LON System

Introduction

A group of Flygt FGCs can communicate with a SCADA system over a power line. A LON server acts as an intermediary, collecting information from the FGCs and transferring it to the SCADA system, and vice versa. Since the LON server and the FGCs use different communication protocols, a SIOX-LON gateway is used to convert information between them.

The basic configuration is one LON server and one SIOX-LON gateway.



Communication Details

Power Line. FGCs communicate with their Gateway unit over the 400 V main power supply. The FGCs must be connected to the same physical media (within the same transformer station).

NOTICE:

Since maximum communication range depends on signal quality, it is recommended to test the quality before deciding on using or installing a LON system.

LON Groups

FGCs communicating with a specific Gateway unit is called a LON group. There can be up to nine LON groups on the same physical media.

SIOX Communication

The Gateway unit and its LON server communicate using a SIOX protocol.

Basic Parts

LON Communication Module

A LON communication module is mounted inside an FGC.

SIOX-LON Gateway

The Gateway unit gathers information from FGCs in a specific LON group, converts the information to SIOX communication protocol, and forwards the information to a LON server.

The Gateway unit also converts information from the LON server back to LON communication protocol, and distributes the information to the FGCs within the LON group.

LON Servers with Supporting Software

The LON server contains software that supports LON communication. For example: LON server APX 711 or FMC 150 with GNC software.

Maximum number of connected FGCs depends on the type of LON server and LON server software. Typical values are 8, 16, 24 or 32.

The software can collect alarm and status information, trend and report data from the FGCs; The software can also distribute remote control commands from the SCADA system.

Installation

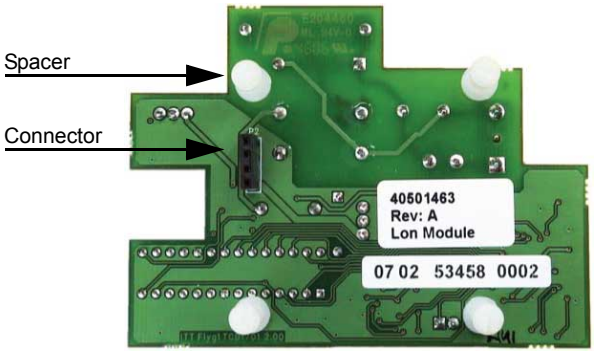
Preparations

Mount the LON Module

The LON communication module is mounted inside an FGC.

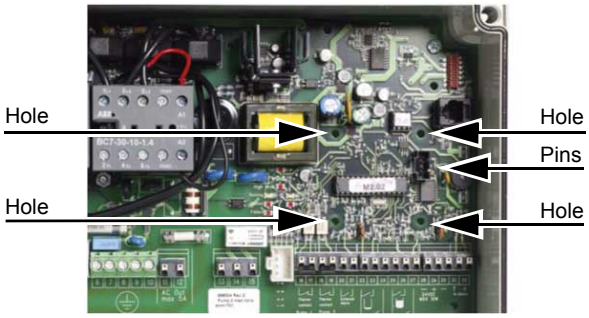
Back of LON module

The figure below shows the connector and spacers on the back of the LON module.



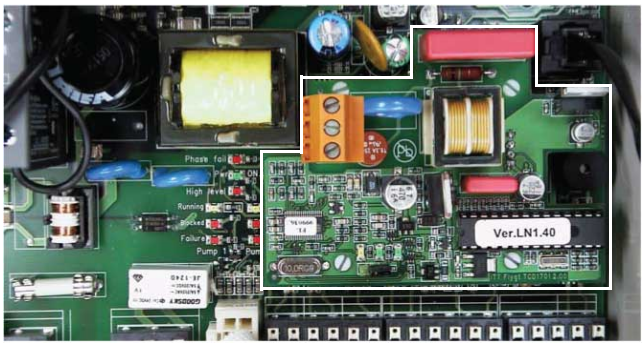
FGC main board

The figure below shows the pins for the connector and holes for spacers on the FGC main board.



Mounted module

The figure below show a mounted LON module.



Mount the LON module

1. Make sure all power supplies are turned off.
2. If installed, disconnect the battery backup module.

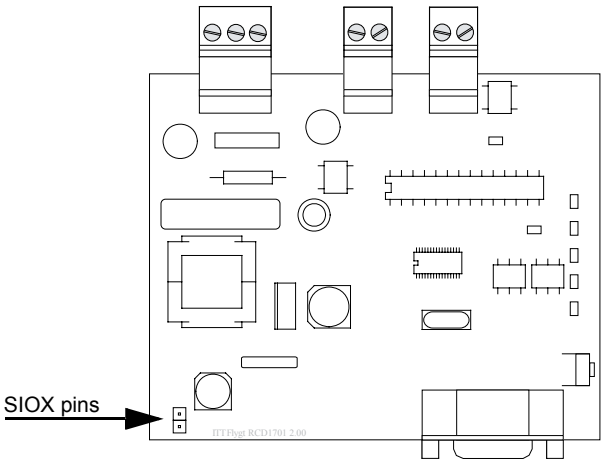
3. Place the LON module so that: –
   - Connector at the back of the module is in line with the four pins on the FGC main board.
   - Four spacers on the back of the module are in line with the corresponding holes in the FGC main board.
4. Press the LON module gently until the spacers snap into the holes. When the LON module is in place, it will receive its power supply from the FGC.

Jumper SIOX Pins

A Gateway unit can communicate with a LON Server over a SIOX bus, or an RS 232-cable.

If SIOX bus is used, jumper the SIOX pins on the Gateway board. Otherwise, skip this section.

1. Remove the front cover.
2. Jumper the SIOX pins.



3. Attach the cover.

Installation

Install a SIOX-LON Gateway

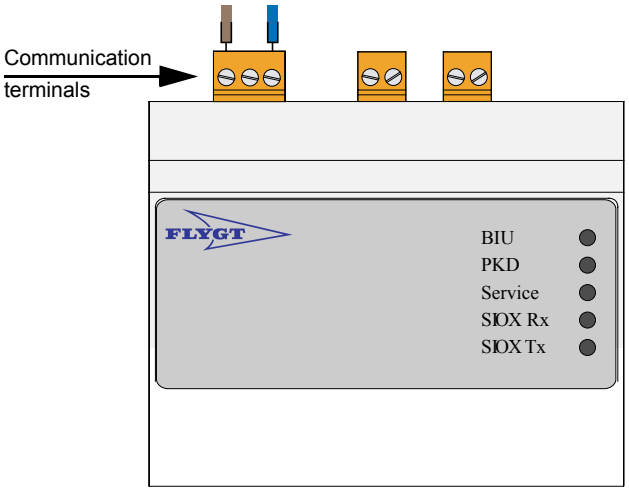
To install a SIOX-LON gateway:

1. Mount the Gateway unit on a DIN rail.
2. Connect the Gateway unit to:
   - Power line
   - 24 VDC power supply, and
   - LON server.

Connect the Gateway unit to the power line

1. Make sure all power supplies are turned off.
2. Connect the first phase or neutral to left-most communication terminal.
3. Connect the second phase or neutral to right-most communication terminal.

The middle communication terminal is not used.

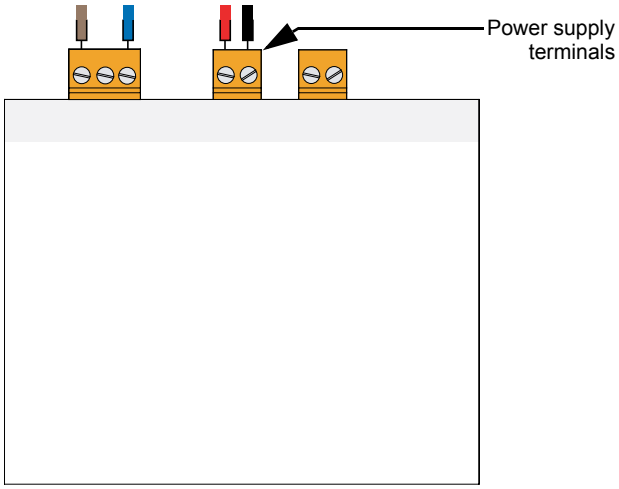


4. Make a note of connected phases (and the color of the power wires).

Connect the Gateway unit to its 24 VDC power supply

1. Make sure all power supplies are turned off.
2. Connect the (+) wire to the left-most power supply terminal in the Gateway unit.
3. Connect the (-) wire to the right-most power supply terminal in the Gateway unit.

The middle communication terminal is not used.



Types of LON server connections

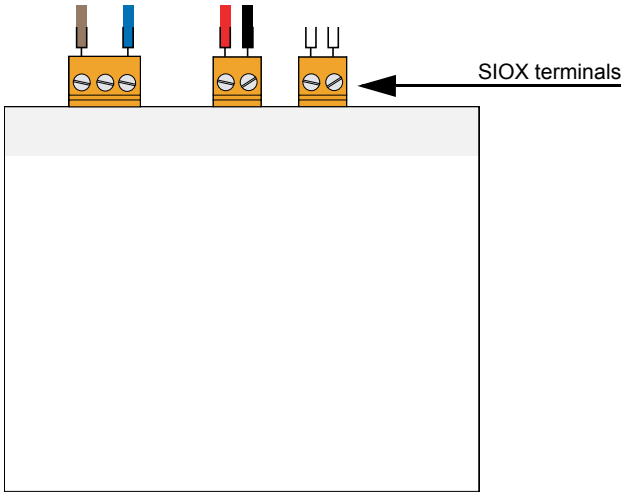
To connect a Gateway unit to its LON server, there are two options:

- SIOX bus, or
- RS-232 connection

Connect the Gateway unit to a SIOX bus in the LON server

1. Make sure:
   - All power supplies are turned off
   - SIOX pins are jumpered.
2. Connect two signal wires between:

- SIOX terminals in the Gateway unit, and
- SIOX bus in LON Server

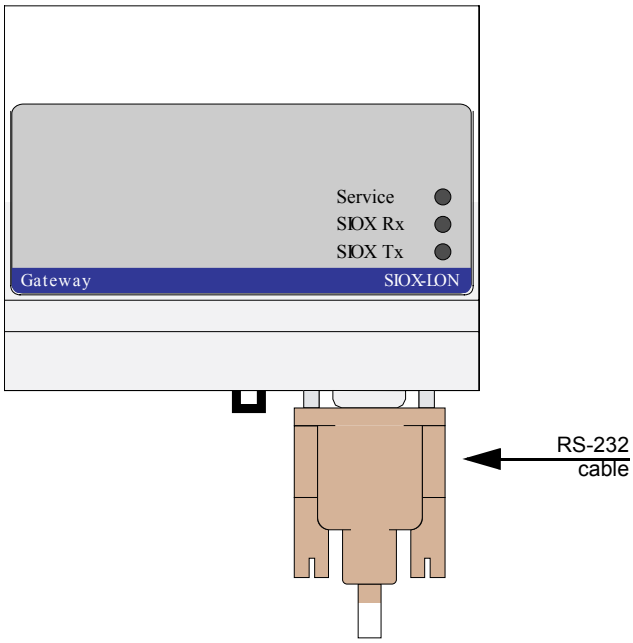


Connect the Gateway unit to a RS-232 connection in the LON server

1. Make sure all power supplies are turned off.
2. Connect an RS-232 cable between:

- Gateway unit, and
- RS-232 connection in the LON server.

Make sure to use a straight serial cable.



Install an FGC

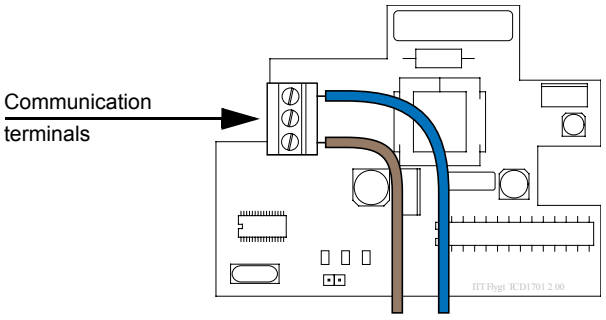
Refer to the FGC installation manual for information on:

- How to install an FGC, and
- How the main power supply and its phases are connected.

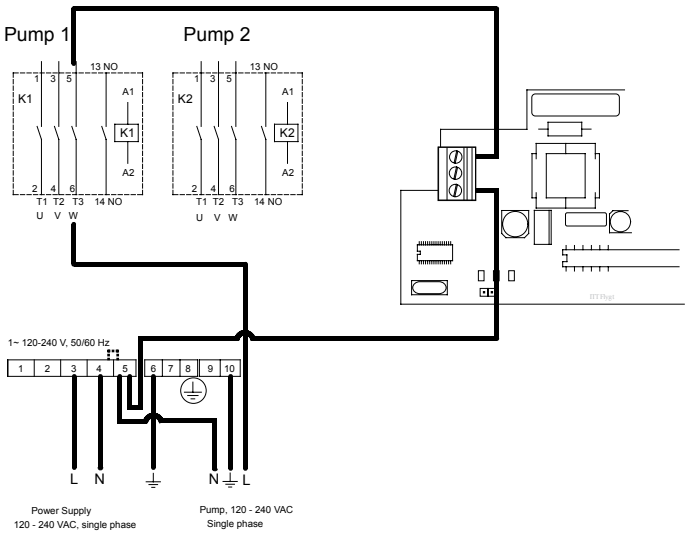
Connect LON communication module to power line

1. Make sure all power supplies are turned off.
2. If installed, remove the battery backup module.
3. Connect two wires from the communication terminals to the FGC power supply:

- Use the same phases as for the Gateway unit.
- The middle communication terminal is not used.



The figure below show an example where one wire is connected to a phase, and the other to neutral input.



Configuration

LON Group	Assign a number to each LON Group. (Range is 1–9, and default is 1). If several LON Servers/Gateway units are connected to the same physical media, use different group numbers to avoid interference.
LON Node	Assign a unique node number to each FGC within a LON group. (Range is 1–32).
LON Domain	Unless Repeaters are used, assign "0" as the LON domain number. ("0" is the default value).

Configure a LON server

Configure the following in a LON server:

- Specify the LON Group number for the Gateway unit connected to the LON server. (The Gateway unit will use this number).
- If required by the LON server software, specify whether a COM-port (RS-232 cable) or SIOX bus is used for communication with the Gateway unit.
- If SIOX bus is used, make sure communication speed is 19200 bps.

Configure an FGC

1. Select "Yes" in the Service menu (13).
2. Specify the LON node number for the FGC in the LON node menu (19_).

3. Specify the LON group number for the FGC in the LON node menu (19_1).
4. Make sure "0" is used as the LON domain number for the FGC in the LON domain menu (19_2).

Communication

Check Communication Status

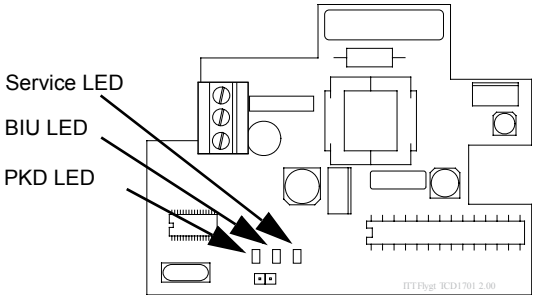
LED indications show communication status.

Available LED indications

LED	LON module	Gateway unit
BIU	X	X
PKD	X	X
Service	X	X
Rx		X
Tx		X

LED locations on a LON module board

The figure below shows the location for LED indications on a LON module board.



BIU and PKD LEDs

BIU stands for Band In Use. When the unit detects a high frequency signal on the 400 V powerline, the BIU LED is lit.

PKD stands for Packet-Detect. When the unit detects a LON signal on the 400 V powerline, the PKD LED is lit.

- When both BIU and PKD are lit at the same time, the detected signal is a message to an FGC.
- When only the BIU LED is lit, the detected signal is only noise on the powerline.

Service LED

NOTICE:

If the Service LED is flashing, the processor is not configured or have no application. Contact Flygt Support for re-programming

SIOX Rx and Tx

SIOX Rx means Character received. When a Gateway unit receives a signal from the LON server, the SIOX Rx LED flashes.

SIOX Tx means Character transmitted. When a Gateway unit transmits a signal to the LON server, the SIOX Tx LED flashes.

Test Communication Quality

To test communication quality, run diagnostic program 22 or 23 in the FGC:

Diagnostic program 22

- This test shows the number of successful test messages in percent.
- With good communication, the value will stabilize at approximately 100.
- With bad communication, the value will continue to drop.

NOTICE:

Special attention value

Risk of apparatus or component damage.

Diagnostic program 23

This test shows the average time (in milliseconds) for a sent test message to return.

- Under very favorable conditions, times down to less than 200 milliseconds can be recorded the communication is very poor, the time will approach the timeout value of 3000 milliseconds.
- If the communication is very poor, the time will approach the timeout value of 3000 milliseconds.

Running the diagnostics

1. Select "Yes" in the Service menu (13).
2. Select either 22 or 23 in the Diagnos. program menu (20_4).
3. Wait for one minute for the diagnostics to stabilize, and then read the result.

NOTICE:

To manually stop the diagnostic program, select "Off" in the Diagnos program menu

Dealing with Bad Communication

If test results are bad:

1. Change connected phases for the Gateway unit and the FGCs.
2. Re-test communication quality.

Maintenance

Check Communication Quality

To check communication quality during normal operation, run diagnostic program 21 in the FGC:

Diagnostic program 21

This program shows the number of successful messages in percent during normal operation.

The value will reset to 100 after a restart of the FGC. A value that:

- Stays at approximately 100 indicates good communication.
- Slowly decreases indicates bad communication or no communication at all.

Running the diagnostics

To run the diagnostics:

1. Select "Yes" in the Service menu (13).
2. Select "21" in the Diagnos. program menu (20_4).

NOTICE:

To manually stop the diagnostic program, select "Off" in the Diagnos. program menu.

Trouble Shooting

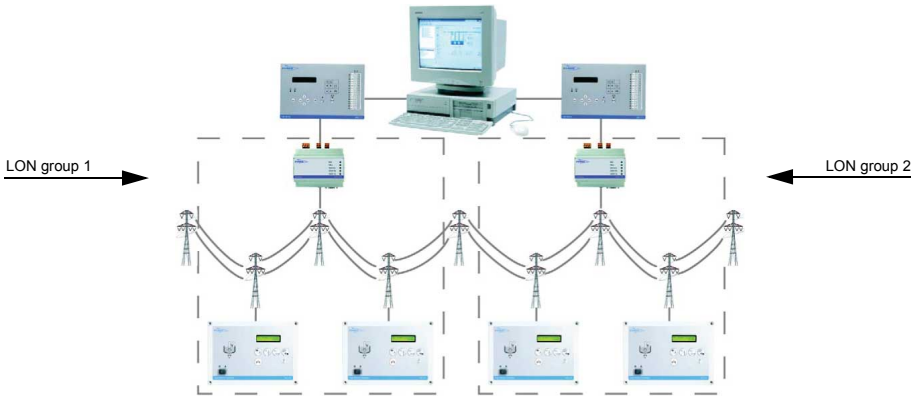
Introduction

If communication problems arise after the installation, it is possible to:

- Add a second LON Server to the same physical media,
- Use a Repeater to extend communication distance, or
- Use signal cables to connect FGCs in locations with bad communication.

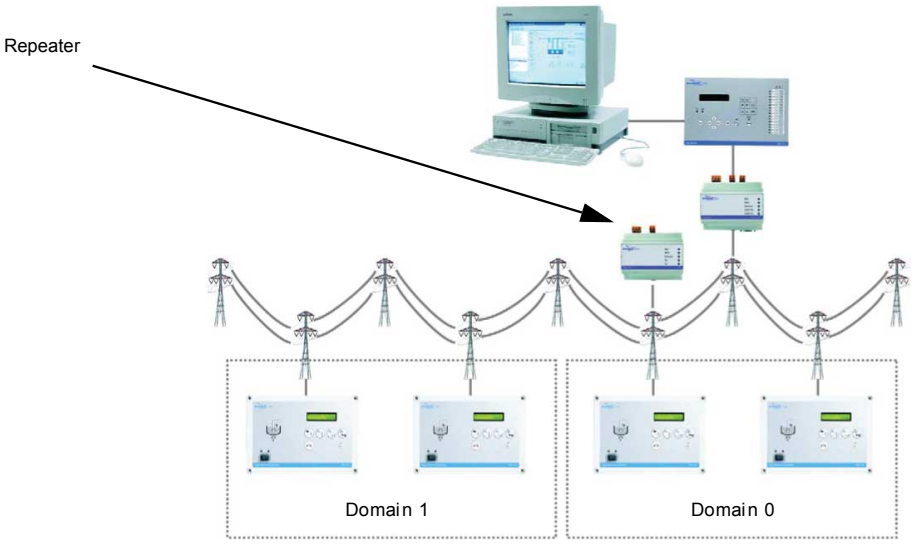
Add a LON Server

When a LON Server is added, divide the FGCs into LON groups, and assign unique group numbers.



Use a Repeater

A Repeater can repeat LON signals on the power line. The repeater is installed on a location with good communication. The FGCs are divided into domains. When the Repeater detects a message from one domain, it resends that message to the other domain.



LON groups

NOTICE:

A Repeater can only be used in LON group 1.

Maximum number of FGCs

The bandwidth is decreased when Repeaters are used. To estimate how much, calculate the following:

- Count FGCs before the Repeater once.
- Count FGCs after the Repeater twice.

For example, in the figure on previous page, the total count is 6 FGCs (2+2+1+1).

This total count should be below 32.

Install the Repeater

A Repeater is installed the same way as a Gateway unit, except that there is no SIOX communication to connect, see also “Install a SIOX-LON Gateway”.

Assign LON domains

The FGCs are divided into domains.

FGCs before any Repeater belong to domain 0. This is the default FGC setting. When there are no Repeaters in the system, all FGCs belong to domain 0.

Repeaters are by default set to domain 1. This means that they repeat messages for domain 1. Thus, the FGCs after the Repeater should be set to domain 1.

FGCs in different LON groups can use the same domain numbers:

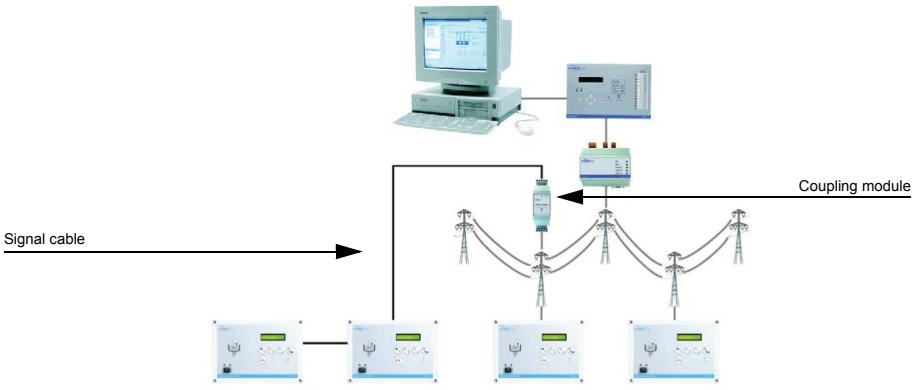
Configure domain numbers

Configure each of the FGCs in the domain after the Repeater:

1. Select "Yes" in the Service menu (13).
2. Enter "1" in the LON domain menu (19_2).

Use Signal Cables

Signal cables can be used to connect FGC locations with bad communication over the power line. The connected cables end in an FGC location with good communication, where the last signal cable is connected to a coupling module. The module is connected to the power line.



Signal cables

Since signal cables should be kept as short as possible. More than one coupling module can be used to connect different sets of FGCs to the power line.

Coupling module

A coupling module is used to switch LON signals from a signal cable to a 400 V power line, and vice versa.

Install a Coupling Module

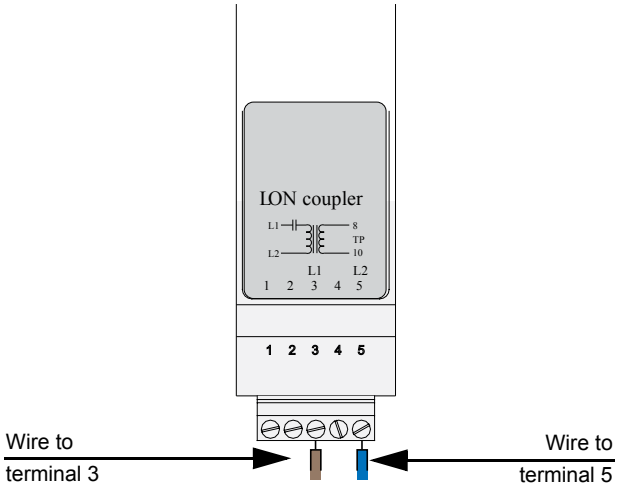
To install a Coupling module:

1. Mount the module on a DIN rail.
2. Connect the module to a signal cable, and.
3. Connect the module to the power line.

Connect a Coupling module to the power line

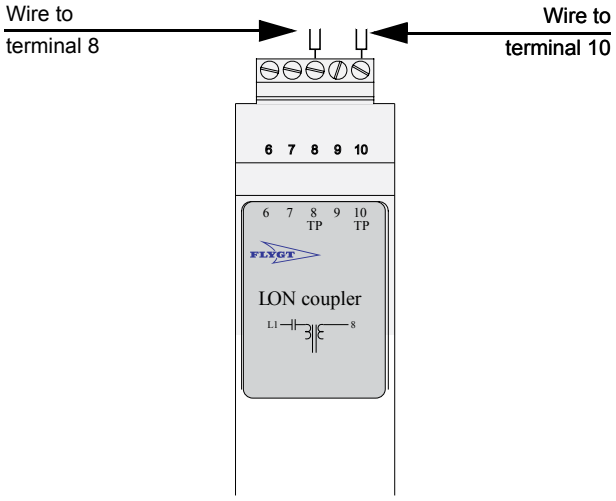
To connect a Coupling module to the power line:

1. Make sure all power supplies are turned off.
2. Connect the first phase/neutral to terminal number 3 (marked as "L1").
3. Connect the second phase/neutral to terminal number 5 (marked as "L2").



Connect a Coupling module to a signal cable

1. Connect a signal wire to terminal number 8 (marked TP).
2. Connect the other signal wire to terminal number 10 (also marked TP).

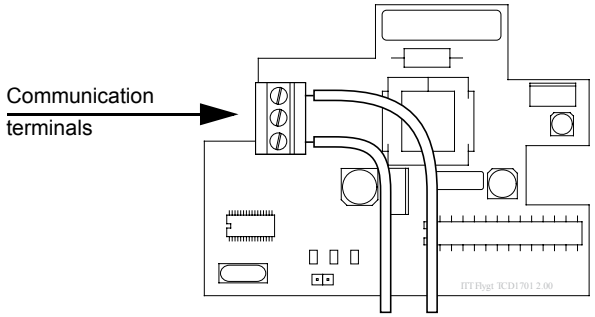


Connect FGC to Signal Cables

To connect a LON communication module with signal cables:

1. Make sure all power supplies are turned off.
2. Connect the signal cable that will run from the FGC:
   a. Connect one signal wire to the top-most communication terminal on the LON module.
   b. Connect the other signal wire to the bottom-most communication terminal on the LON module.

   The middle communication terminal is not used.



Transformer Station

A LON signal cannot pass a transformer station, but two coupling modules connected with a signal cable can work as a bridge. The modules transport LON signals between the connected transformer areas.

Electrical Hazard:

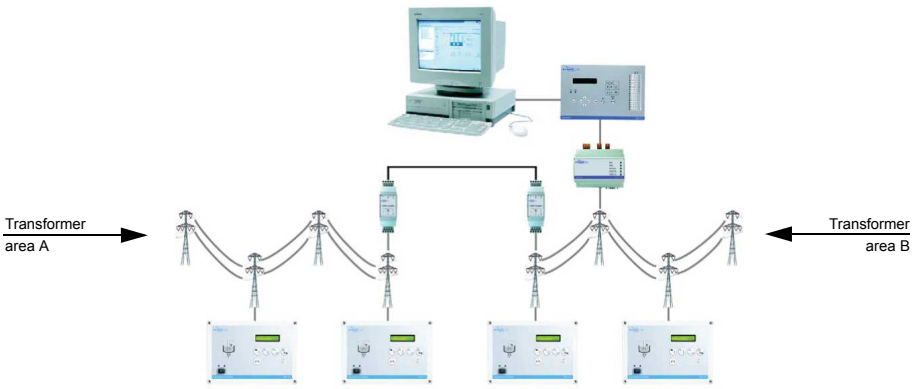
Permission from the power supplier is usually required.

NOTICE:

Since coupling modules decrease a LON signal, avoid having more than one set of modules between an FGC and its Gateway.

Transformer example

The figure shows two connected transformer areas.



System Specification

Flygt FGC LON System

Communication

Frequency

CENELEC band C, 125-140 kHz
CENELEC band B, 95-125 kHz

Media

Mains power line or signal cable.	80db
Maximum attenuation	

Distance

Depends on the cables and the quality of the power line. To find out the maximum distance in each application, tests are necessary to carry out.

Approvals and Standards

EMC emission standard	EN 61000-6-3
EMC immunity standard	EN 61000-6-2
Electrical safety	EN 61010-1

Requirements

Communication equipment

- 1 LON Communication module per FGC [1]
- 1 LON Server and 1 Gateway unit per LON group [1]

[1] Max 9 LON groups on the same physical media.

Type of LON server

- APX 711/FMC 150 including GNC software (it supports LON communication
- APP 721/FMC 200 including software supporting LON communication
- APP 741/FMC 400 including software supporting LON communication

Maximum number of connected FGCs

APX 711/FMC 150	32 per LON server 8 per LON server
APP 721/FMC 200	8 per LON server
APP 741/FMC 400	8 per LON server

Options and Accessories

Coupling module

Repeater

LON Communication Module

Ordering Information

Denomination	FGC LON Module
Part number (1 pcs)	40 501463
Part number (48 pcs bulk package)	40 501535

Power Supply

Powered by the FGC main board

Environment

Operational temperature	-20º C to +50º C
Storage Temperature	- 10º C to +70º C
Humidity (non-condensing)	90% RH
Enclosure	Mounted inside the FGC

Material

Dimensions (W x H)	85x64 mm
Weight, total	60 g
Mounting	Inside FGC on its main board

LED Indications

BIU (Band In Use)

PKD (PacKage Detect)

Service

Connections

LON communication	2 pcs 2,5 mm^2 terminal
Main board	Socket

Communication

LON communication over power line

Signal cable

SIOX-LON Gateway

Ordering Information

Denomination	FGC LON Module
Part number	40 501463

Power Supply

Rated voltage

24 VAC/VDC (18-30 VAC/VDC)

Fuses

Power line fuse	Max. 6,3 A (non-replaceable)
Main supply fuse	100 mA (non-replaceable)

Environment

Operational temperature	-20° C to +50° C
Storage Temperature	- 10° C to +70° C
Humidity (non-condensing)	90% RH
Enclosure	IP 20

Material

Dimensions (W x H)	105x86x58 mm
Weight, total	200 g
Mounting	DIN-rail
Enclosure, base	Polyphenylene oxide (PPO)
Enclosure, cover	Polycarbonate (PC)

LED Indications

BIU (Band In Use)

PKD (PacKage Detect)

Service

SIOX Rx (receive)

SIOX Tx (transmit)

Connections

LON communication	2 pcs 2,5 mm^2 terminal
SIOX communication	2 pcs 2,5 mm^2 terminal RS 232 [2]
Power supply	2 pcs 2,5 mm^2 terminal

[2] A cable with D Sub 9-pin connectors (male/female) is needed to connect to the LON Server.

Communication

LON communication over power line

SIOX communication (19200 bps)

LON Communication Module APX 711 APP721

Requirements

Software supporting LON communication

Technical Data

For technical data on an LON Server, refer to its separate Technical Specification. For technical data on relevant LON Server software, refer to their separate Technical Specifications, or contact your local Xylem supplier.

Repeater

Ordering Information

Denomination	FGC LON Module
Part number	40 501544

Power Supply

Rated voltage

24 VAC/VDC (18-30 VAC/VDC)

Fuses

Power line fuse	Max. 6,3 A (non-replaceable)
Main supply fuse	100 mA (non-replaceable)

Environment

Operational temperature	-20° C to +50° C
Storage Temperature	- 10° C to +70° C
Humidity (non-condensing)	90% RH
Enclosure	IP 20

Material

Dimensions (W x H)	105x86x58 mm
Weight, total	200 g
Mounting	DIN-rail
Enclosure, base	Polyphenylene oxide (PPO)
Enclosure, cover	Polycarbonate (PC)

LED Indications

BIU (Band In Use)

PKD (PacKage Detect)

Service

SIOX Rx (not used)

SIOX Tx (not used)

Connections

LON communication	2 pcs 2,5 mm^2 terminal
Power supply	2 pcs 2,5 mm^2 terminal

Communication

LON communication over power line

Coupling Module

Ordering Information

Denomination	FGC LON Module
Part number	40 500920

Environment

Operational temperature	-20º C to +50º C
Storage Temperature	- 10º C to +70º C
Humidity (non-condensing)	90% RH
Enclosure	IP 20

Material

Dimensions (W x H)	85x64 mm
Weight, total	85 g
Mounting	Inside FGC on its main board
Enclosure, base	Polyphenylene oxide (PPO)
Enclosure, cover	Polycarbonate (PC)

Connections

LON communication	2 pcs 2,5 mm^2 terminal
Signal cable	2 pcs 2,5 mm^2 terminal

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1) The tissue in plants that brings water upward from the roots
2) A leading global water technology company

We're 12,000 people unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

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Visit our Web site for the latest version of this document and more information

The original instruction is in English. All non-English instructions are translations of the original instruction.

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